Vesuvius Dam
Across Storms Creek near
intersection of County Roads 20 & 29
Ironton Vicinity
Lawrence County
Ohio

HAER No. OH-121

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
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HISTORIC AMERICAN ENGINEERING RECORD

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USGS Ironton, Ohio Quadrangle
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Significance: Vesuvius Dam is significant for its historical associations with the Civilian Conservation Corps and the U.S. Forest Service's development of Wayne National Forest. It is an important reminder of the early 20th century development of parks and national forests as resources for public recreation. The dam was also constructed by enrollees of the Civilian Conservation Corps, an important New Deal program that combatted unemployment while providing labor for conservation and facilities improvement projects in national forests and other locations.

Description: Vesuvius Dam and Lake Vesuvius are located on a wooded site near Ellisonville in Lawrence County. The site is approximately six miles north of the city of Ironton. The lake and recreation area are reached from Lawrence County Road 29, an access road that branches off of State Road 93. The topography of the site is quite variable, with numerous hills, valleys, and limestone cliffs. This area includes the Vesuvius Furnace site (HAER No OH-116). Adjacent to this area is the dam itself, which has created a long, narrow L-shaped lake that extends about four miles to the north. Northwest of the dam is a wooded hilltop camping area that is the site of two historic recreation buildings. The entire recreation area, including the lake, spreads out over approximately one square mile of land and has an area of approximately 2,000 acres. The lake covers a surface area of approximately 145 acres.

Lake Vesuvius Dam is an earthen structure with an overall height of 51 feet. The width of the dam at its crest is 15 feet and the length of its crest is 425 feet (see figure 1). The main section of the dam is a large earth embankment composed of an impervious clay core that is 15 feet wide at the crest of the dam and 25 feet wide at its base. The clay core then extends about 10 feet below the dam, into the blue clay stratum that the dam is built on (see figure 2). At the sides of the dam, the clay extends to the rock stratum underneath the dam. On each side of the clay core is a large mound of earth with stone or rubble probably mixed in. This part of the dam extends out approximately 200 feet at the base of the dam. At

the foot of the mound on the front face of the dam is a small area of stone construction known as the toe, designed to prevent the dam from moving upstream. The dam's rear slope has a lining of hand placed limestone slabs, each roughly four feet square. These stones prevent erosion of earth in places where the lake's surface makes contact with the dam.

The dam has two ways of allowing water to escape from the lake. The first is a concrete spillway at the east end of the dam. This spillway consists of a concrete channel that allows excess water to flow out of the lake to prevent the dam from being damaged by excessive water levels (see figure 3). The spillway has no gate. A curved concrete slope on the west side of the spillway allows water to flow out of the lake into the spillway channel. A concrete wall begins at the north end of the spillway slope, then curves to the east. It then runs south, forming the east wall of the spillway channel. The spillway floor is built of reinforced concrete and slopes downward from the lake, creating a deep channel cutting through the dam. This channel has high concrete walls on each side. The channel is crossed by a small wooden bridge that extends over the channel at the crest of the dam.

The dam is designed to accommodate a maximum of 41 feet of water in the lake. When the water level in the lake exceeds 41 feet, water freely cascades down the curved concrete spillway slope. The water then flows through the overflow channel into the deep, 40 foot wide downward sloping spillway channel. The water then flows down into a large low pool known as the stilling basin, then passes into a stone lined channel that maintains a 40 foot width. A baffle has been placed in the channel to slow the speed of the water flow and the channel itself curves sharply to the west, then runs a straight southwestern course for approximately 230 feet. The channel then curves south and empties into Storms Creek. The spillway has a small wooden foot bridge positioned at the crest of the dam to allow pedestrians to cross over the spillway when walking across the dam.

The dam's second water escape mechanism is its pond drain. This consists of a 48 inch diameter concrete pipe that travels through the dam at its base (see figure 4). A small concrete tower on the rear (north) face of the dam contains a hand operated iron sluice valve that will open or shut the drain. The water travels through the drain and empties into a small channel 8 feet wide. This channel immediately curves sharply to the southeast and runs a straight course for 220 feet, until it empties into Storms Creek. The channel is lined with stone. The pond drain allows the lake's water level to be lowered for maintenance or other purposes.

History:

Prior to the construction of the dam, the Vesuvius Furnace area was a narrow valley surrounded on two sides by steep stone cliffs. Storms Creek ran an irregular course through the middle of the valley. The site had a long history of industrial use related to the Vesuvius Iron Furnace, which had been built prior to 1836 and was operated until 1906. The furnace was probably located here because of the nearby availability of wood, coal, water and iron ore. The furnace produced pig iron, a commodity for which this part of Ohio was well known in the early to mid-19th century. It is not known if the site was utilized in the years between the closing of the furnace and the purchase of the site by the U.S. Forest Service.

In the early 20th century, a movement was initiated to create national forest areas in many parts of the United States. Meanwhile, hundreds of acres of agricultural land in southern Ohio had been abandoned between 1900 and 1920; taxes had not been paid on much of the land for many years. Much of this land was not maintained and erosion problems were very common. As a result of these problems, a move was made in the 1930s to establish a number of areas where land would be purchased by the federal government, with the eventual goal of establishing a national forest in the area. In 1934, the Wayne Purchase Units were approved by the Ohio legislature and the federal government began assembling land for the creation of a national forest. The units were administered by Region 9 of the U.S. Forest Service, which covers the Midwest and is headquartered in Milwaukee. The land purchased by the forest service was treated for erosion and other problems and trees were planted on much of the land. The resulting forest lands were used by the public for outdoor recreation and were also useful as wildlife habitats. Timber has also been cut from some sections of the forest, providing a material in heavy demand for building and many other purposes.

Recognizing the importance of the Wayne Purchase Units as recreational sites, the Forest Service soon began building recreational facilities within the purchase units. By 1936 the Forest Service had decided to undertake the most ambitious of these recreational construction projects, the construction of a dam near the site of Vesuvius Furnace along Storms Creek. The narrow cliffs closing in the creek on each side made the site ideal for the construction of a medium size dam to create a moderate-sized lake for recreational purposes. The Vesuvius location was only a few miles away from Ironton, Ohio, and was only a short drive from the population centers of Portsmouth, Ohio, and Huntington, West Virginia.

Vesuvius Dam sits in an area of unglaciated plateau in southern Ohio. The rugged topography of the dam site, with its limestone and sandstone cliffs, is primarily the result of stream erosion. The rock of the area is composed of sandstone and limestone with deposits of coal and low grade iron ore mixed in. The soils of the area are generally thin and cohesive. Core samples of the dam site taken in 1936 revealed about 15 feet of clay, sand, and slag that was waste material from the iron furnace.

Plans for the dam were drawn up by the engineering division of U.S. Forest Service Region 9 from October to December 1937. H. Coleman was the supervising engineer. Earth dams were commonly built in the 1930s to create artificial lakes and for flood control purposes. In the 1930s, numerous earthen dams were built in southeastern Ohio, especially by the Zanesville District of the U.S. Army Corps of Engineers. However, due to the unique topography and geographic strata of each location, a standard uniform dam design could not be imposed on a specific site. While Vesuvius Dam has a vague resemblance to the earthen dams built by the Corps of Engineers on southern Ohio's Muskingum Watershed in the 1930s and 40s, the dam also has a unique combination of features specific to the site. The dam also differs from most Corps of Engineers dams in southeast Ohio and western Pennsylvania, in that its purpose is not flood control, but the creation of a recreational lake. Because of the non-flood control purpose of the dam, the spillway has no gate to hold back excess water. The pond drain does have a gate that can be opened and shut, but the small size of its pipe prevents it from allowing large amounts of water to escape from the lake at one time.

Designers of earth dams in the 1930s were able to take advantage of advances made during the early 20th century in soil studies and hydrology. The flow of water into reservoirs and its effect on dams was better understood, as were the properties of various materials like clay, silt, and soil that could be used to build an earth dam. The embankment of Vesuvius Dam is built according to a widely-used method in which a core of clay forms an impervious layer in the middle of the dam, preventing water from seeping through. The clay also extends about 10 feet underground to prevent underground water from seeping through underneath the dam.

The core of the dam is covered on the north and south sides by earth that is probably mixed with crushed stone or rubble. The original plans for the dam identify this part of the dam as a "selected material" and no construction records have been located that identify the specific material. From inspection of the dam, the material appears to be earth with crushed stone mixed in.

The dam was also designed with a concrete spillway on its east side. Spillway design varied with the site of the dam and the preferences of the designer. Location of the spillway at the side of an earth dam was common, but spillways were also placed at the center of many dams. For a dam built across a canal or another body of water that is stable and well regulated, the spillway is of minimal importance. However, if a dam is built across a river or stream that provides drainage for a large tract of land, the spillway is a critical component of the design. If water rushes too quickly into a lake maintained by an earth dam, the water can flow over the top of the dam, a condition known as overtopping. This situation is one of the most common causes of earth dam failure. While a masonry dam can tolerate a moderate amount of overtopping, overtopping leads to destructive erosion on an earth dam, and usually results in the failure of the structure.

Because of this, spillways for earth dams like Vesuvius must be designed to allow a large amount of water to escape from the lake in order to avoid overtopping the dam. A spillway with inadequate flow can easily cause the destruction of an earth dam. Thus, the spillway design at Vesuvius is one of the features most important in maintaining the dam's structural integrity. The second method of allowing water to escape from the dam, the pond drain, is not as essential for the dam's survival. Its purpose is not to allow water to speedily escape from the lake during flood time. Instead, it is used to gradually lower the lake's level to below the usual pool maintained by the dam. This might be done for various reasons. Water could be released from the lake in anticipation of an upcoming flood. Water from the lake also might be released to keep the lower part of Storms Creek from going dry during a drought. Also, the drain can be used to lower the water level to allow repairs on parts of the dam that are usually submerged. The lake might also be lowered via the pond drain to facilitate removal of undesirable species of fish from the lake, or for other reasons related to maintenance or wildlife management.

Dams are commonly found on National Forest sites. The U.S. Forest Service Office of Engineering estimates that over 2300 dams exist within national forest boundaries. The U.S. Forest Service owns many of these dams, but a significant number are operated by private owners or by government agencies other than the Forest Service. Since every dam site is unique in terms of its geography and topography, the design features of many dams are dictated by site conditions.

U.S. Forest Service Region 9 built a number of dams in national forest areas to create small lakes in the 1930s. A project somewhat similar to

Vesuvius was completed by Region 9 at Mondeaux Dam in Wisconsin in 1937. Mondeaux Dam is an earth fill structure of somewhat smaller dimensions than Vesuvius Dam. Its spillway is in the center of the dam, and is designed very differently from the spillway at Vesuvius. This again points out the variation in dam design necessary because of specific site conditions. A context for 1930s USDA Forest Service earth dams has not been written, so it is not possible to determine at this time if the Vesuvius design was typical of its time or whether it was an innovative structure.

We do know that the plans for Vesuvius Dam were reviewed by Graham Walton, an instructor in hydraulic and sanitary engineering at the Hydraulic and Sanitary Laboratory of the University of Wisconsin. Walton found the dam's spillway design to be satisfactory. He thought that it would allow water to escape from the lake quickly enough to prevent damage to the dam resulting from too high a water level. However, he did believe that the spillway design could be improved so that the cost of building it could be decreased and the water flow out of the spillway could be facilitated. More efficient water flow would offer a larger margin of safety for the dam in times when Storms Creek was dumping large amounts of water into the lake.

Walton and his staff built a pine model of the Vesuvius spillway and embedded it in a sand construction simulating the earth dam. They worked in a special laboratory designed to accurately test models of dams and other water related structures. Walton changed the wood spillway model after observing its performance in simulated high stress conditions in the lab. He curved the corner of the spillway wall at the point where water first escapes from the lake. He theorized that building this curved wall would be more cost effective because it would use less concrete. He also found that it would improve the efficient flow of water out of the lake. To slow down the speed of water flowing into the lower spillway channel, Walton also advocated the installation of a baffle in the stilling basin. This would help prevent erosion damage to the stone lined spillway channel and to the stream bed and banks of Storms Creek. A report on the spillway design tests was released in August 1937. By October 1937 the changes suggested by Walton were incorporated into a new spillway drawing for the dam. Additional new drawings for the dam were executed in March and April 1938.

Few details have survived about the construction of the dam itself. For earth dams like Vesuvius, construction begins with the clearing of the dam site and a geological investigation of the site. Existing soil and other

materials are cleared from the site and the stream or river involved is diverted to prevent the flooding of the construction site. The diversion is often achieved with a small temporary dam and/or through piping the stream water around the site. Excavations are made for parts of the dam that will extend below ground level and the pond drain or other outlet works are also constructed. The impervious clay core of the dam is then built. The clay is carefully tamped and rolled with machinery until it reaches the specific density required to ensure the safety of the dam. The spillway is built and earth, sometimes mixed with rubble and rock, is spread over the clay core. The temporary diversion of the stream or river is then removed and water begins to fill the basin created by the dam.

Many projects completed in national forests during the 1930s and early 40s were results of a partnership between the U.S. Forest Service and the Civilian Conservation Corps (CCC). During the years of its existence, form 1933 to 1942, the CCC employed approximately three million young men between the ages of 17 and 25. Selection policy, determined by an advisory council, limited enrollment primarily to single men whose families were on public relief rolls and who were willing to allot $22 to $25 of their monthly $30 wage to their dependents. Averaging over 2,000 camps, the relief program employed anywhere from 300,000 to 500,000 workers assigned to projects administered by the Department of the Interior or the Department of Agriculture. Individual work camps, situated on public land throughout most states and territories of the United States, contained facilities built and run by the U.S. Army.

Of the projects completed by the CCC, over 75 percent were under the jurisdiction of the Department of Agriculture, with 50 percent of these for the U.S. Forest Service. In projects involving a Forest Service-CCC partnership, the Forest Service generally provided technical knowledge and completed design and engineering work while the CCC provided and supervised the labor needed to complete the projects. Typically, a CCC company working in a national forest could be involved in many tasks including planting trees, preventing forest fires, and controlling land erosion. CCC companies were also often involved in construction projects ranging from earthworks to road building to the erection of recreation buildings.

The construction of Vesuvius Dam and its associated recreational facilities was the result of one such partnership between the CCC and the U.S. Forest Service. The project was executed under the supervision of the USDA Forest Service, with construction of the dam the primary work of CCC Company 0526-C stationed at nearby Pedro, Ohio. The company

was known at various times as Camp Logan, Camp Dean, Camp Lawrence, and Camp Vesuvius. The company had originated in 1934 at Fort Knox, Kentucky, and had relocated to Camp Logan in Hocking County, Ohio, in 1935. By 1937, the company had moved to Camp Dean, which was near the town of Pedro, only a few miles from the Vesuvius site. The company had about 200 enrollees in 1941, with a supervision staff of about 12. The camp was commanded by U.S. Army Lieutenant Burt D. Ferris. The camp provided labor for the construction of Vesuvius Dam, but it also provided educational opportunities for the enrollees. The camp held classes in subjects ranging from basic English and math to photography, auto repair, carpentry and other subjects. Besides construction work at Vesuvius, the enrollees of Company 0526-C were also involved in wildlife conservation, spotting forest fires, and other services. The company remained at Pedro as late as 1942, but by that year the United States had entered World War II, and the CCC program was phased out as human resources were directed towards the war effort.

Newsletters from Company 0526-C proudly characterized Vesuvius as the largest recreational project in Ohio. Because company newsletters only survive from 1937 and 1940-41, many specific details about the CCC's activities in building the dam have been lost. A September 1937 newsletter editorial indicated that since they had arrived in Lawrence County, the enrollees of Company 0526-C had been working almost exclusively on Vesuvius Dam. The editorial also reported the cost of the dam building project as approximately $100,000. Based on this editorial, we must conclude that the CCC had begun excavation and site clearing work for Vesuvius Dam while the Forest Service was revising its spillway drawings in Autumn 1937. The work of constructing the dam seems to have taken place from 1938 to 1940. By 1941 the dam was complete, and site improvements like landscaping, beach development, and the construction of recreational buildings were being completed. Newsletter descriptions indicate that the enrollees of Company 0526-C were involved in a number of tasks related to the construction of Vesuvius Dam. These included crushing rock, moving earth by hand, operating machinery and heavy equipment, and pouring concrete. The experience of building dams introduced CCC enrollees to the complexities of construction. In addition, the creation of a useful and attractive feature like a lake was a very strong source of pride for the camps involved.

When completed the Vesuvius Recreation Area was centered around a medium sized lake with an 8 mile shore line. Use of the lake was facilitated by campgrounds and beaches developed by the CCC. Recreational use of the lake was also facilitated by the construction of

seven recreational buildings by the CCC from 1937 to 1941. These structures included a museum/classroom building, two latrines and a bath house to be used by the public, as well as a warehouse, recreation office, and garage to assist in the administration of the site by Forest Service personnel. The construction of Vesuvius Dam and development of the associated recreation area was the main accomplishment of CCC Company 0526-C during its years at Pedro. Reflecting an increased pride its location and work the company changed its name in 1940 from Camp Dean to Camp Lawrence, and again in 1941 to Camp Vesuvius in recognition of the dam's completion.

Vesuvius Dam has been maintained by the Forest Service since its completion. The appearance of the dam has changed very little since it was finished. However, problems have occurred with the concrete spillway. Apparently, the concrete was poured by inexperienced workers, varying in quality from poor to excellent. As a result, some of the concrete has required repair or replacement. In 1954-55 extensive grouting and slab replacement was carried out on the floor of the spillway. Less extensive repairs and concrete patching were carried out on other concrete parts of the spillway in 1964 and 1978. However, all of these repairs have followed the original design of the dam and no major alterations to the design have been made. As a result, the dam today retains its historic appearance.

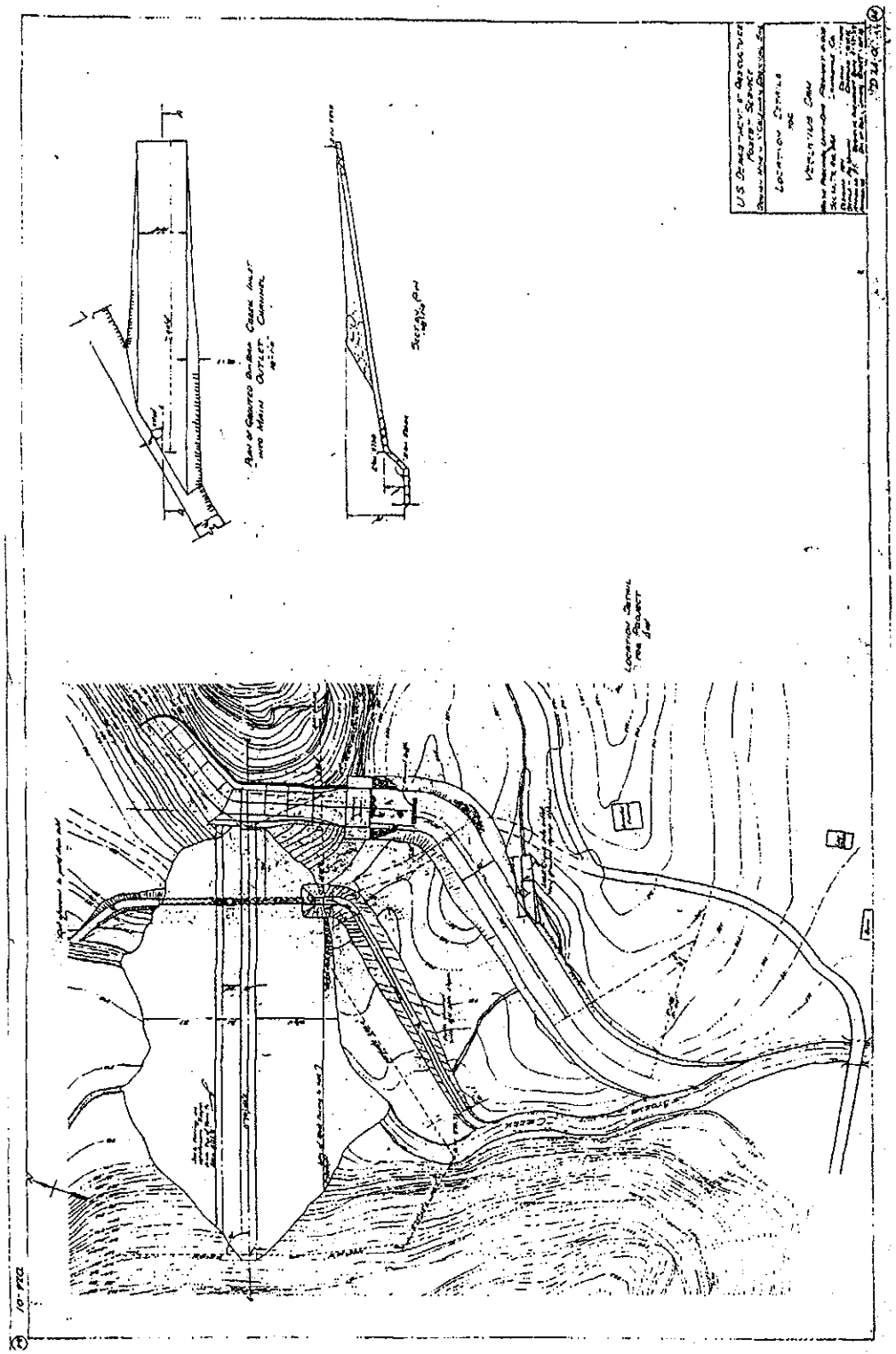

Fig. 1. Photocopy of 1938 drawing of dam with outlet channel details. (Original drawing in possession of USDA Forest Service Region 9 Headquarters, Engineering Division.)

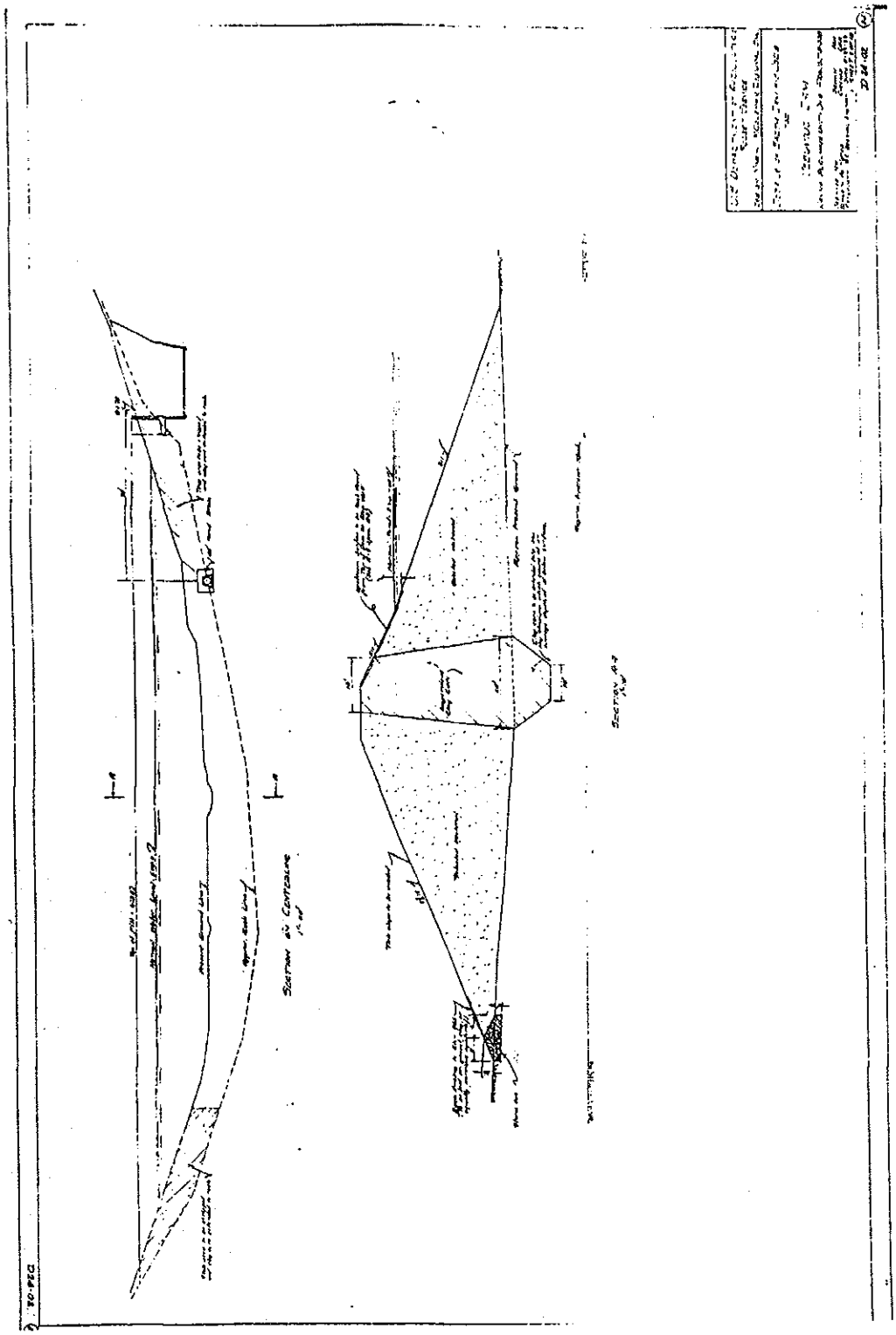

Fig. 2. Photocopy of 1938 section drawing of dam. (Original drawing in possession of USDA Forest Service Region 9 Headquarters, Engineering Division.)

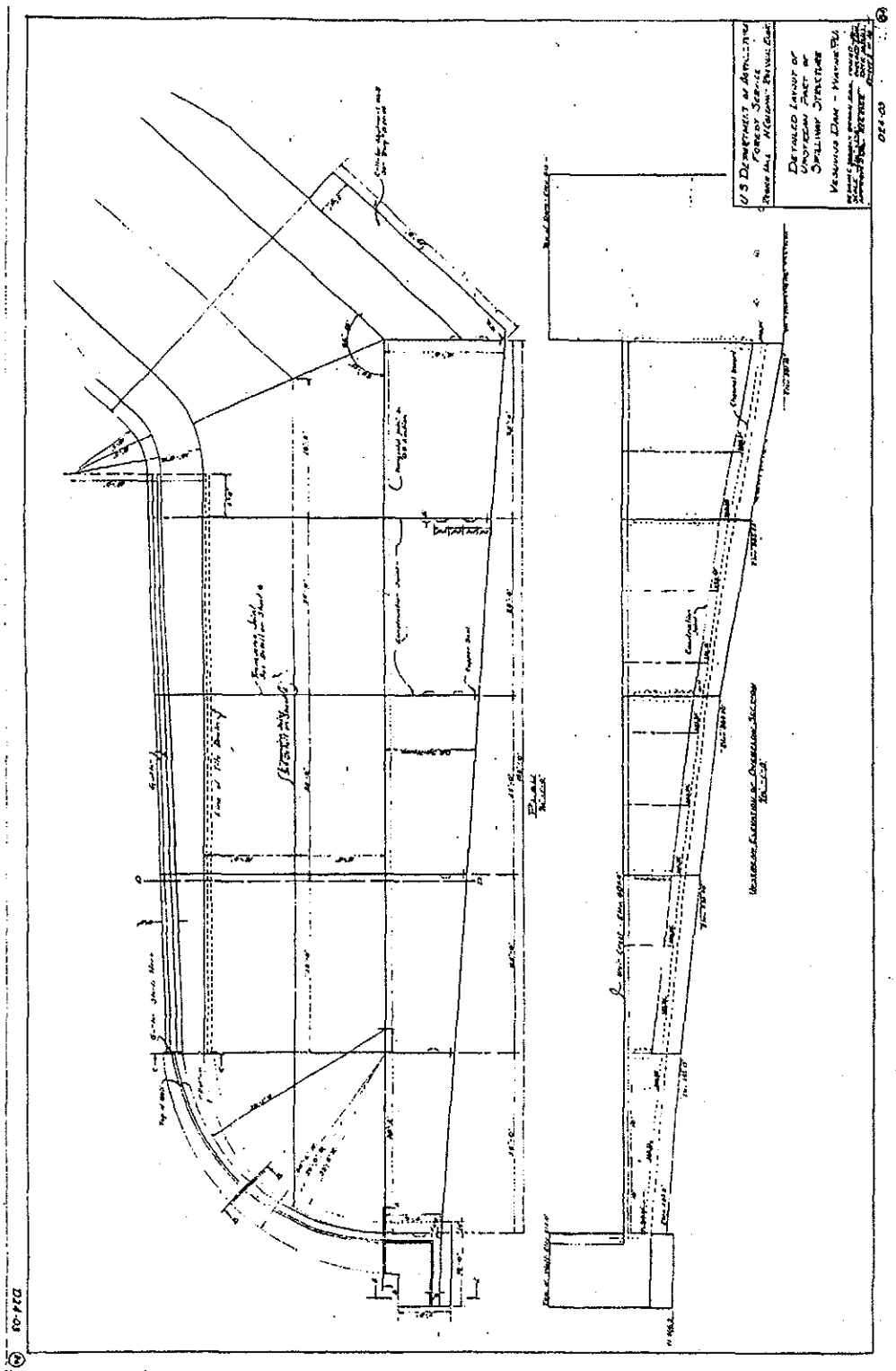

Fig. 3. Photocopy of 1937 drawing of spillway channel. (Original drawing in possession of USDA Forest Service Region 9 Headquarters, Engineering Division.)

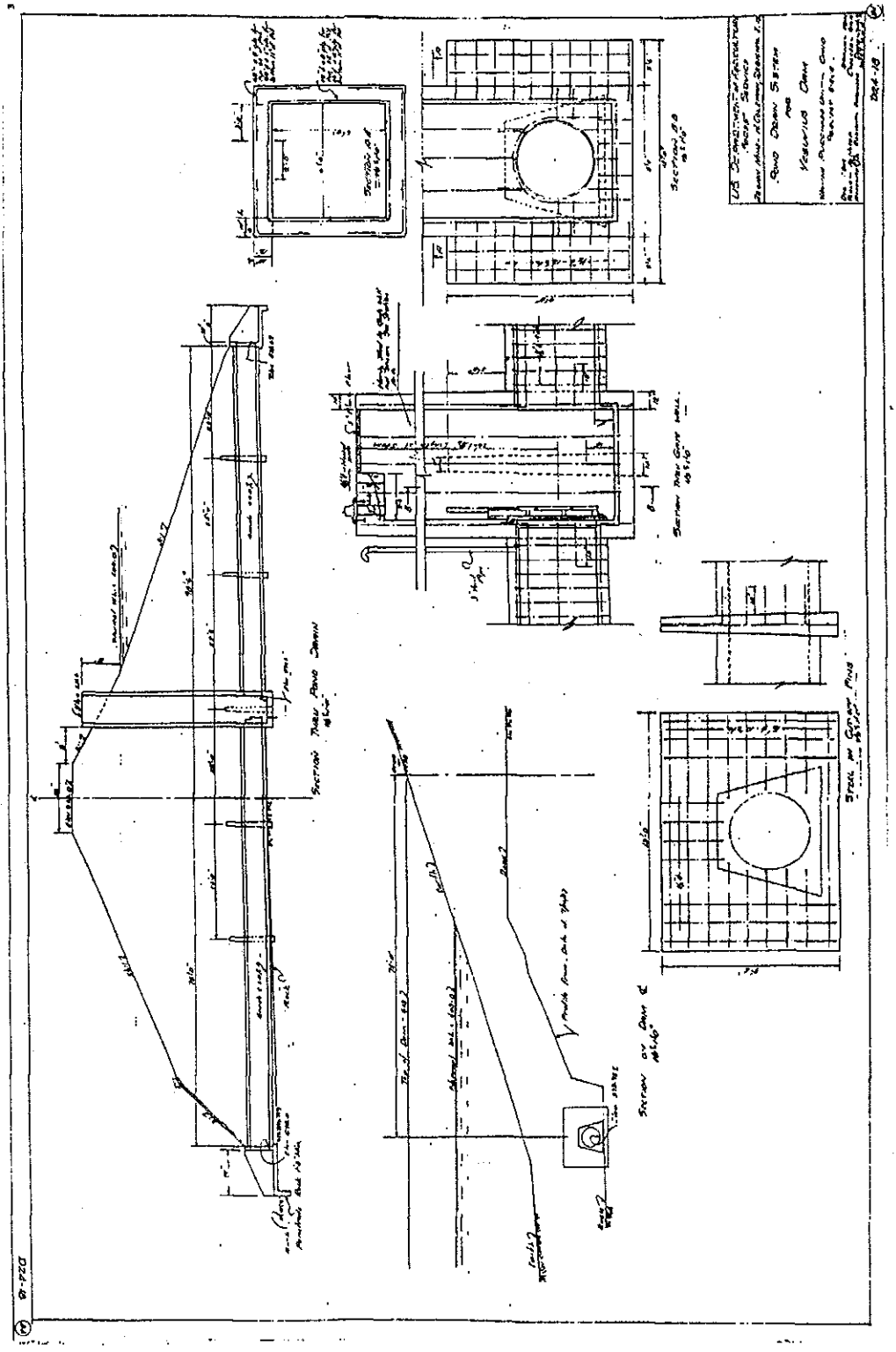

Fig. 4. Photocopy of 1937 drawing of dam details and section of pond drain. (Original drawing in possession of USDA Forest Service Region 9 Headquarters, Engineering Division.)

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